

FIG. 4

PL:PL1a(PL1b,PL2aPL2b)

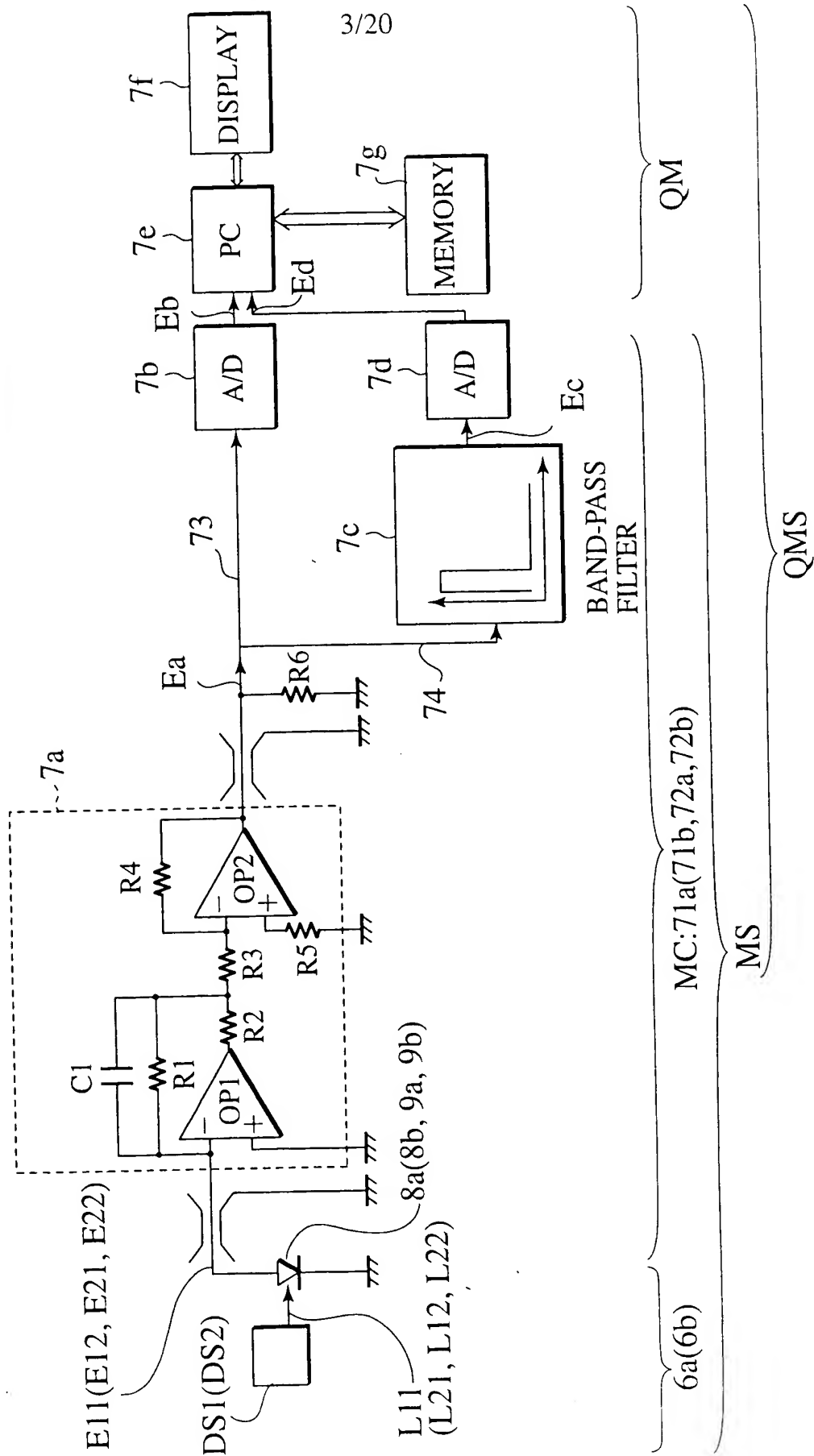


FIG.5

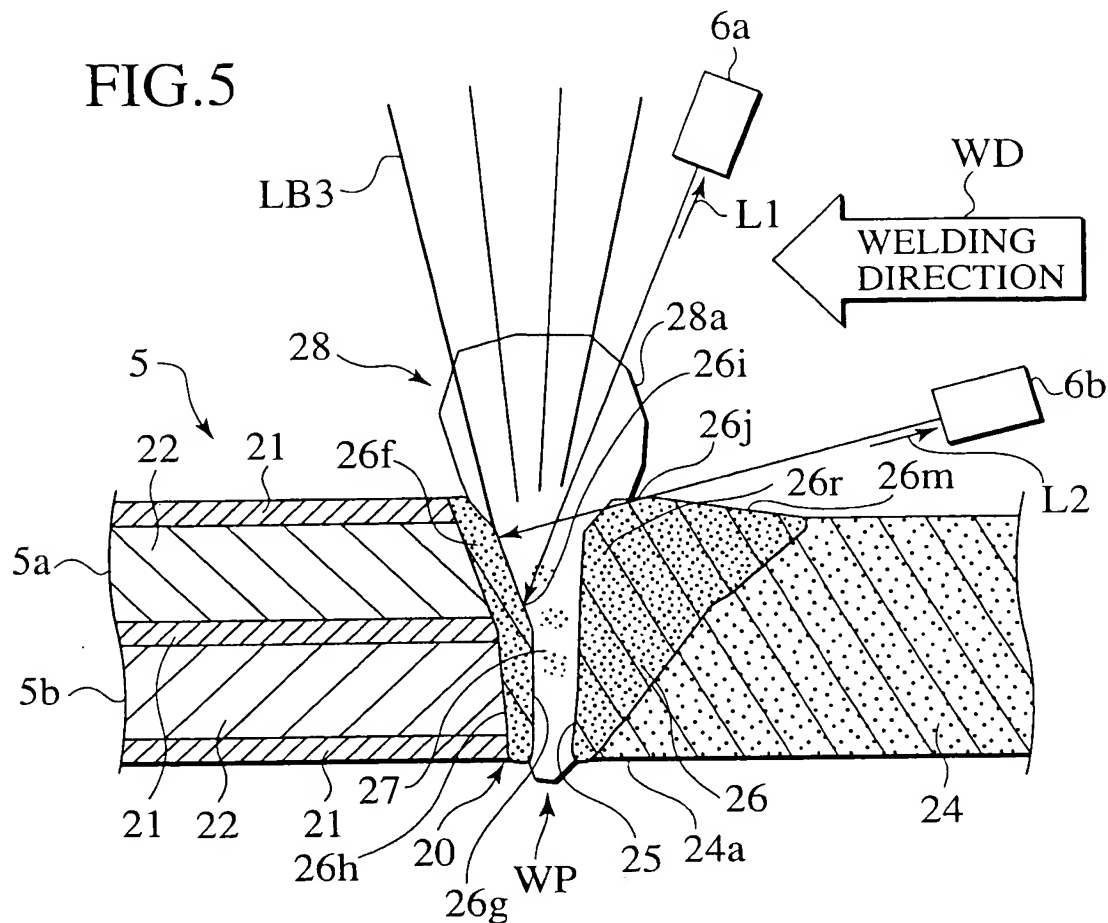


FIG.6

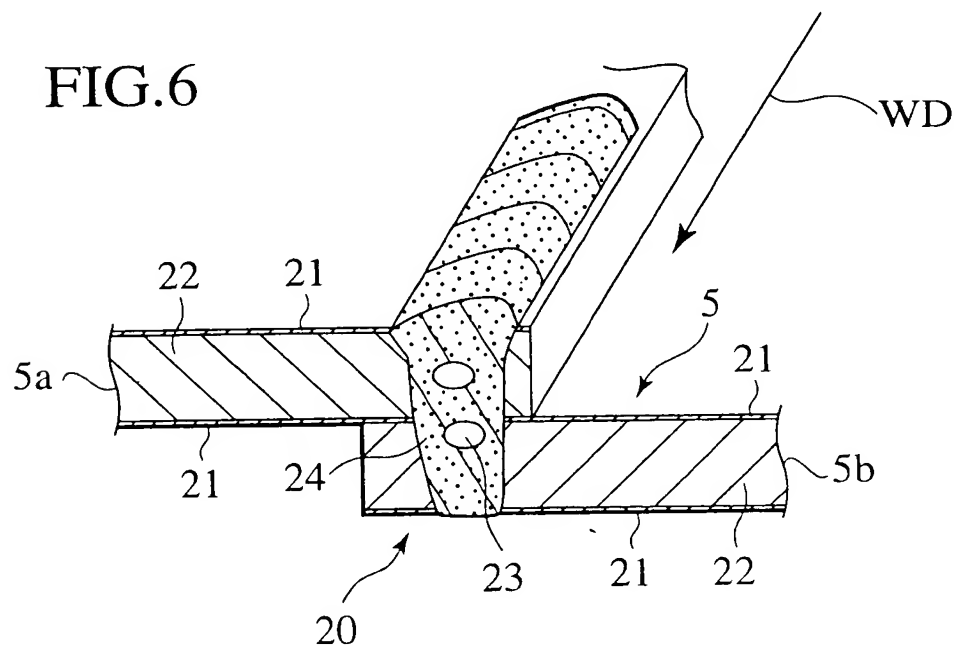


FIG.7

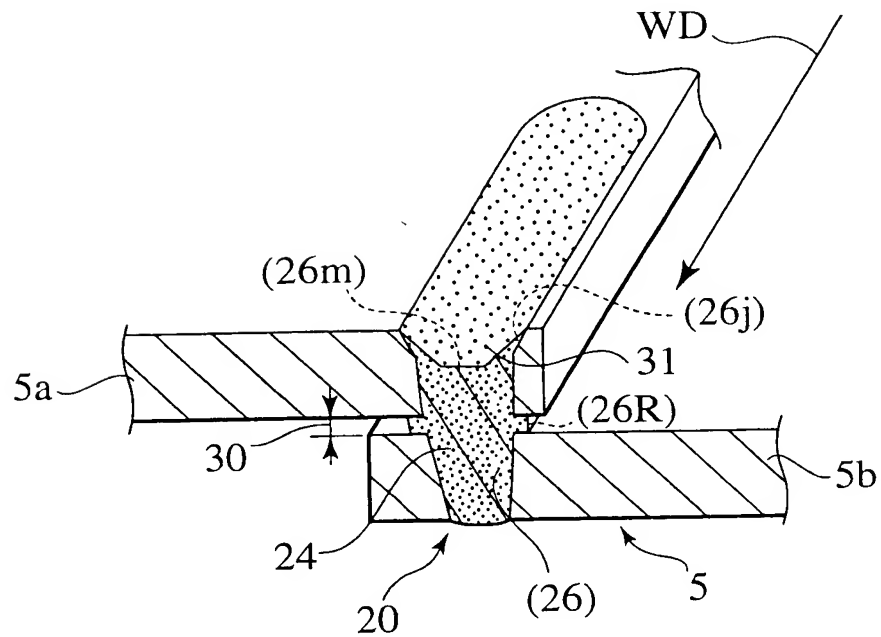


FIG.8

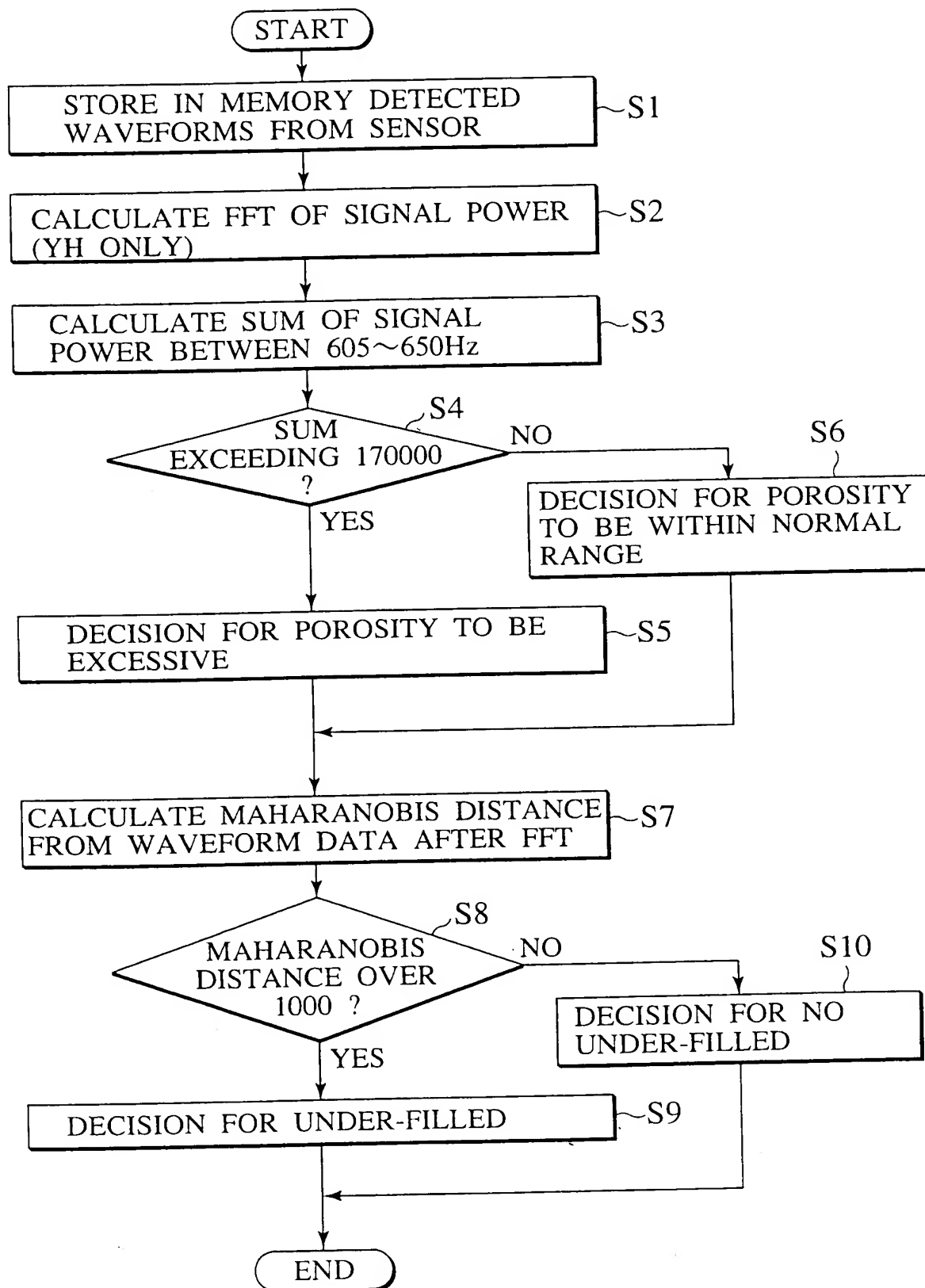
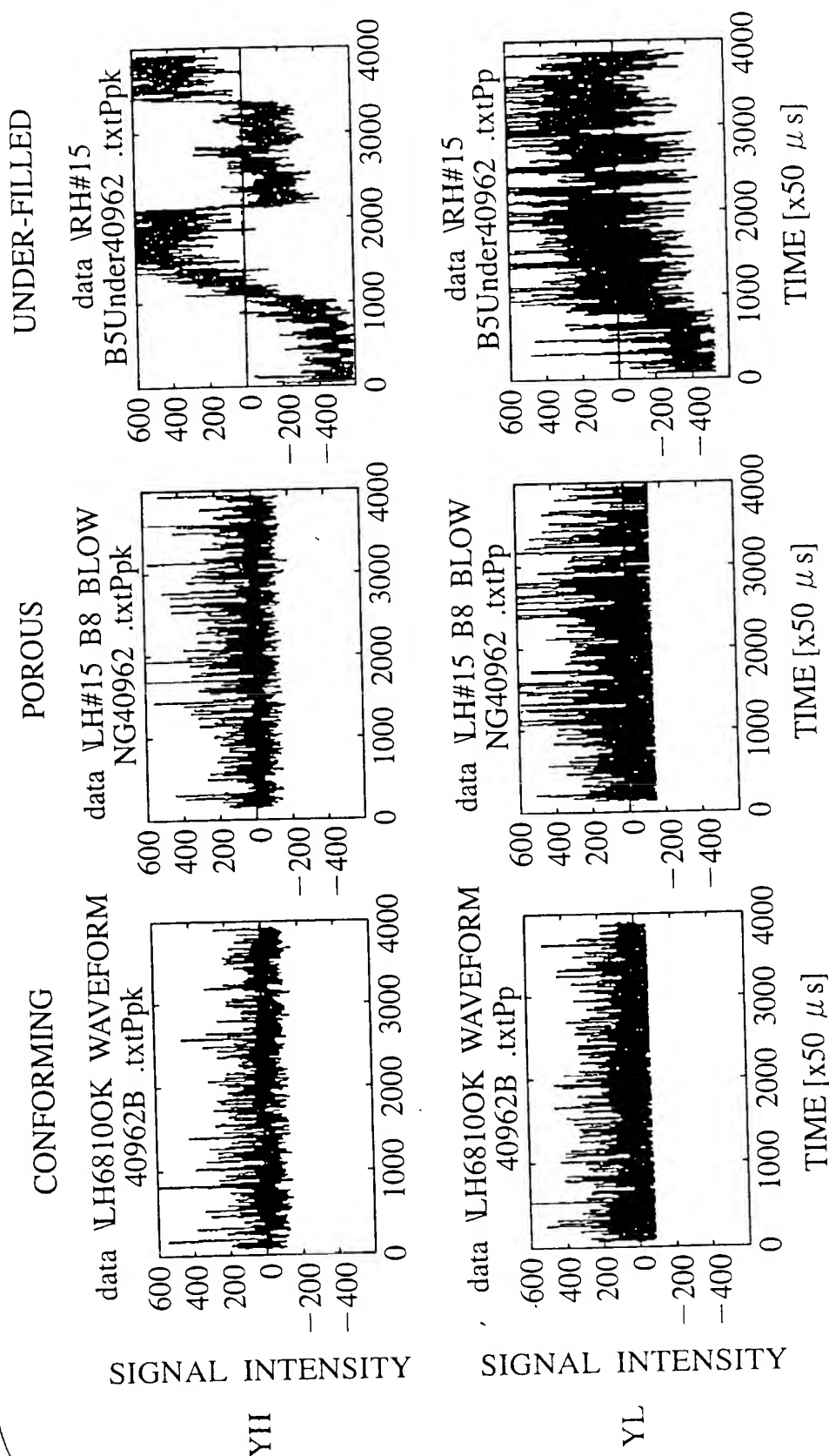
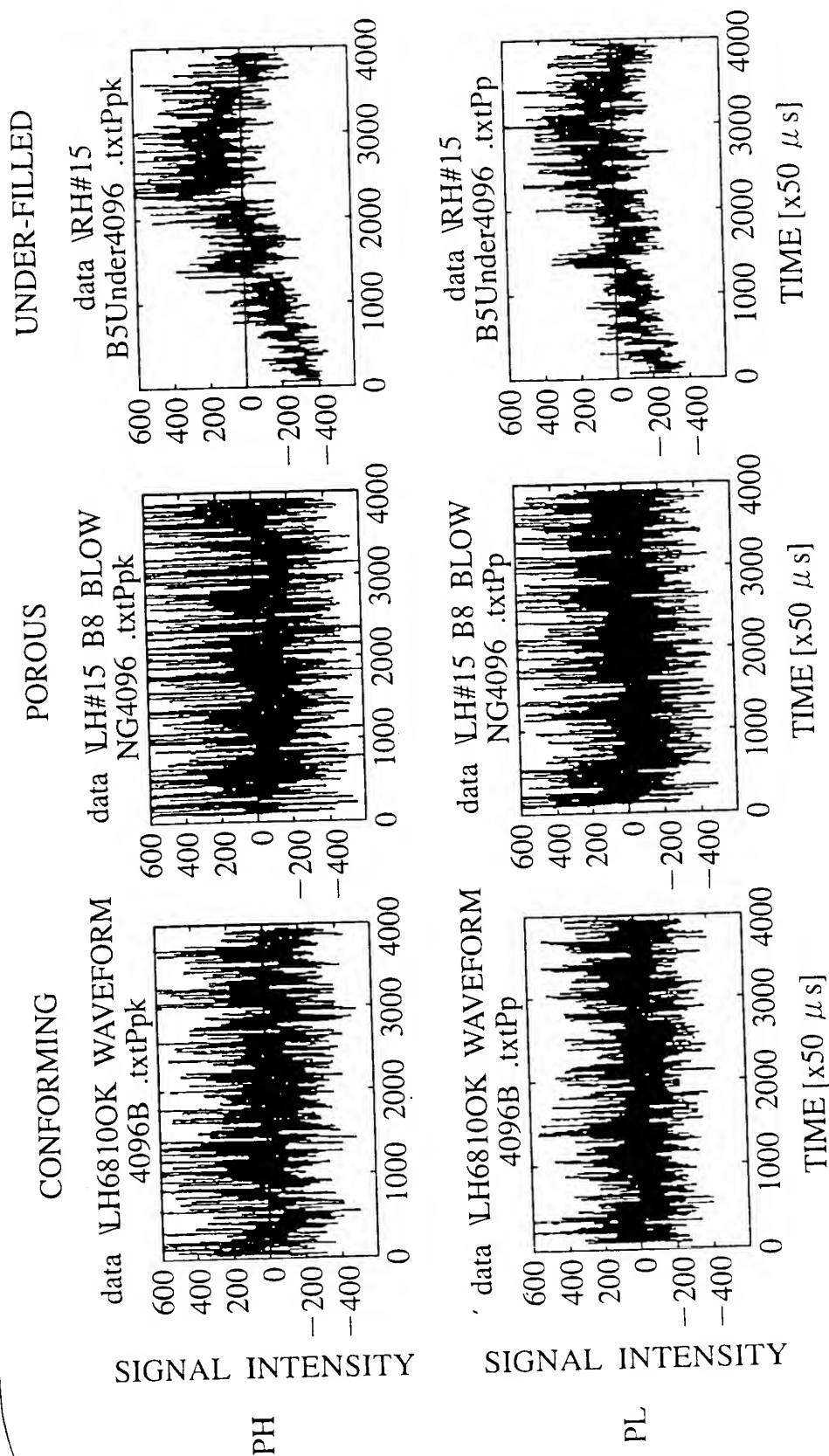


FIG. 9



DETECTED WAVEFORMS UNDER BASIC WELDING CONDITIONS

FIG.10



DETECTED WAVEFORMS UNDER BASIC WELDING CONDITIONS

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FIG.11

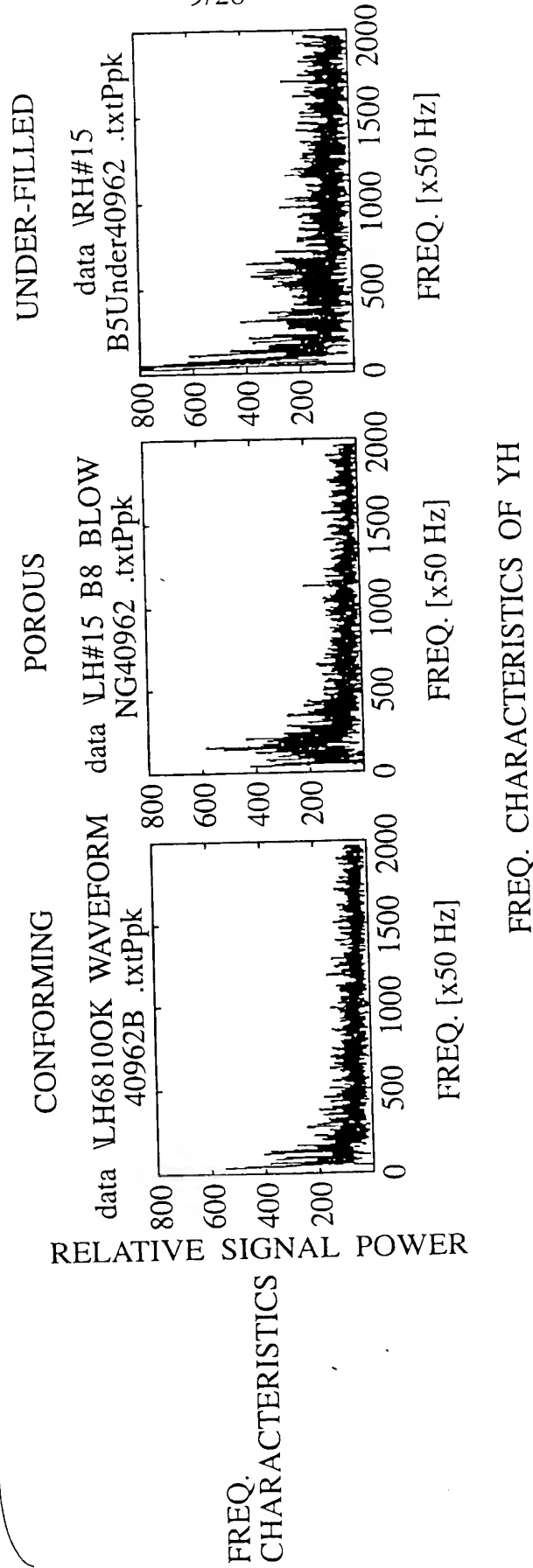
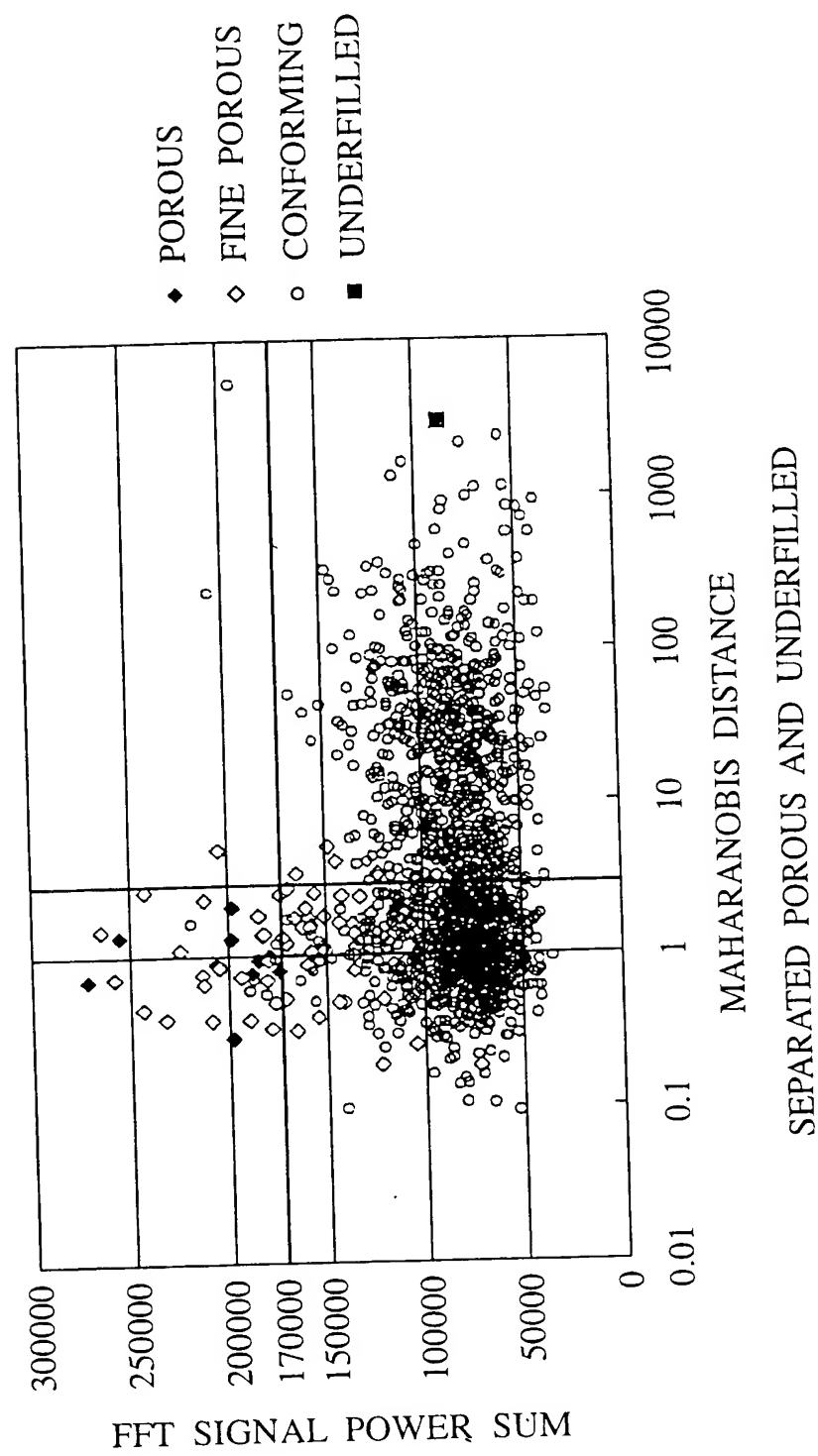


FIG.12



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FIG.13

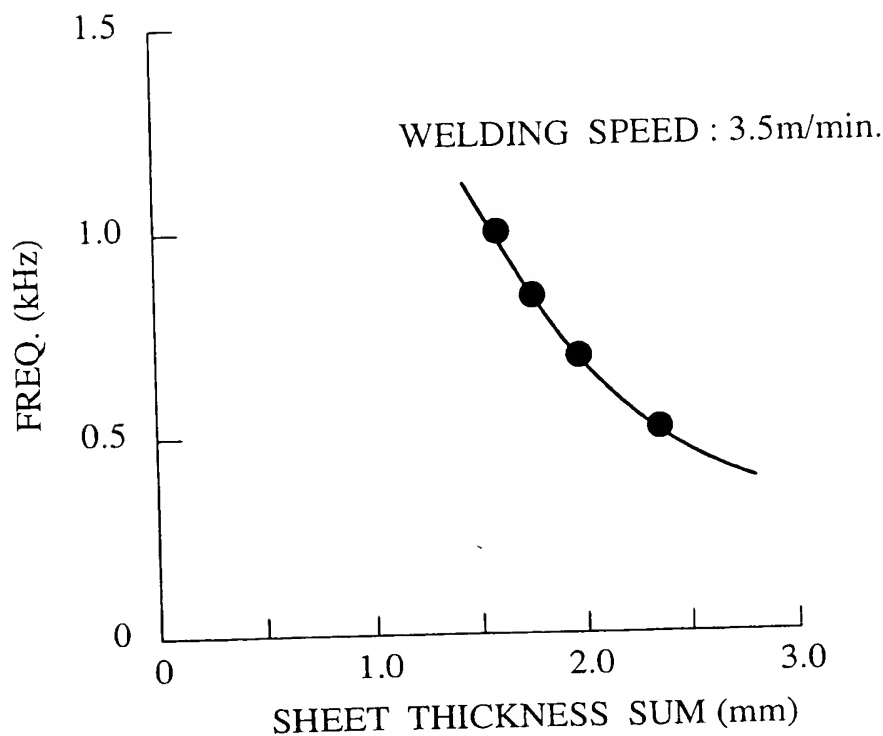


FIG.14

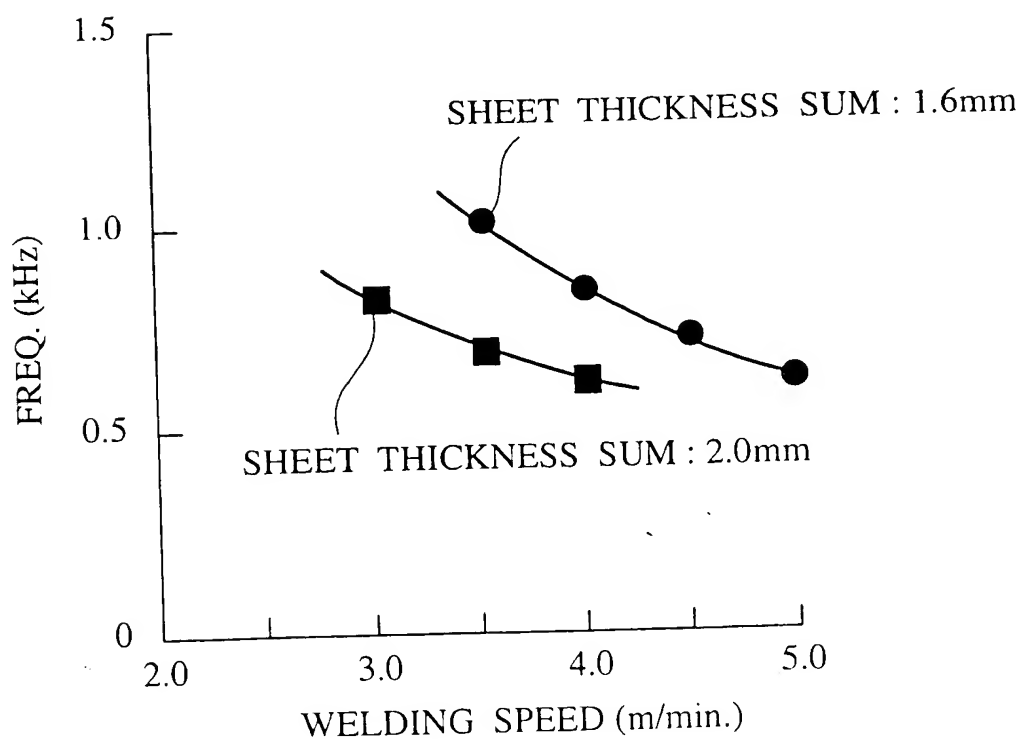


FIG.15

TABLE-1

		UPPER SHEET t_1			
		LOWER/UPPER	0.8mm	1.0mm	1.2mm
LOWER SHEET t_2	0.8mm		3.5m/min.	3.5m/min.	3.5m/min.
	"		4.0m/min.		
	"		4.5m/min.		
	"		5.0m/min.		
	1.0mm		3.5m/min.		
	1.2mm		3.0m/min.		
	"		3.5m/min.		3.5m/min.
	"		4.0m/min.		

FIG.16

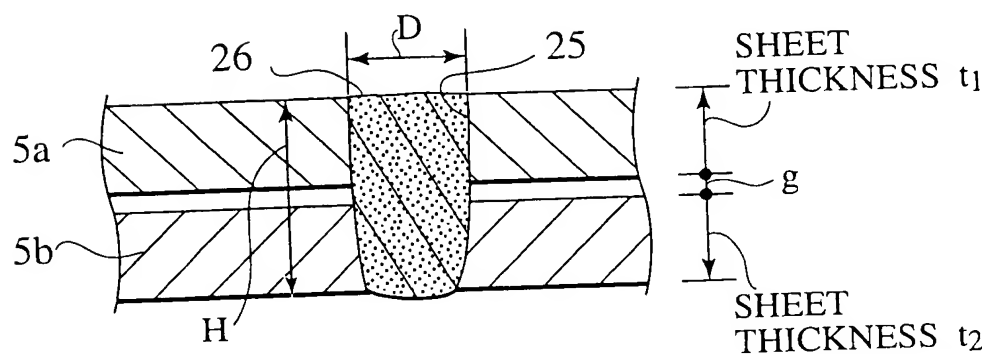
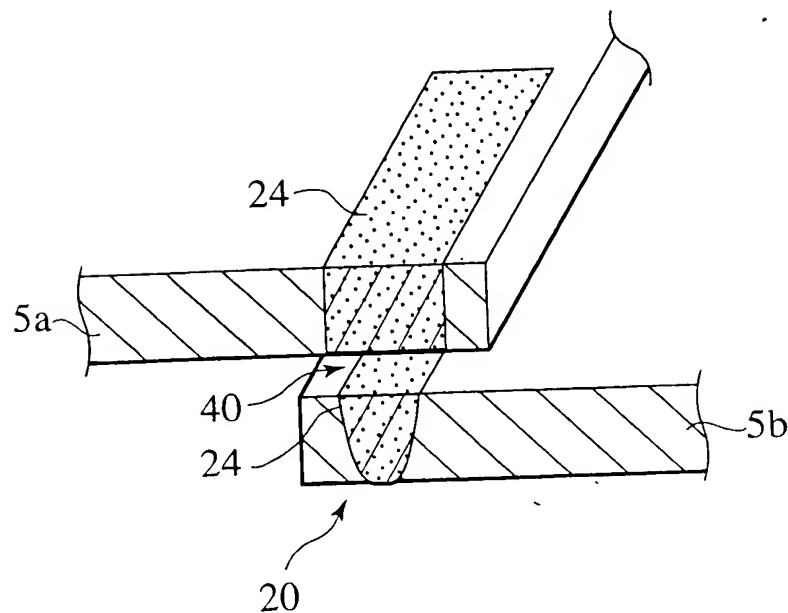


FIG.17



START

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FIG.18

DECISION ON WHOLE BEADS

STORE IN MEMORY DETECTED
WAVEFORMS FROM SENSOR S21

CALCULATE FFT SIGNAL POWER SUM S22

CALCULATE SIGNAL POWER SUM
IN FREQ. BANDS OF 0~1.0kHz AND
3kHz~6kHz S23

IN PRESET
CONFORMING REGION ? S24

YES

S25

DECISION FOR
CONFORMING

NO

S26

IN UNDER-FILLED,
POROUS OR NON-WELDERD
REGION ?

YES

S27

DECISION FOR
UNDER-FILLED
POROUS OR
NON-WELDED TO BE
PROBLEMATIC IN
QUALITY

NO

S28

DIVIDE BEAD INTO SUB-SECTIONS,
CALCULATE FFT SIGNAL POWER OF
SUB-SECTIONS

CALCULATE SIGNAL POWER SUM IN
FREQ. BANDS OF 0~1.0kHz AND
3kHz~6kHz IN EACH SUB-SECTION S29

DECISION FOR EACH SUB-SECTION
TO BE CONFORMING, UNDER-FILLED,
POROUS OR NON-WELDED S30

CALCULATE CONFORMING
PROPORTION OF BEAD S31

OVER PRESET
CONFORMING PROPORTION ? S32

YES

S33

DECISION FOR
CONFORMING

NO

S34

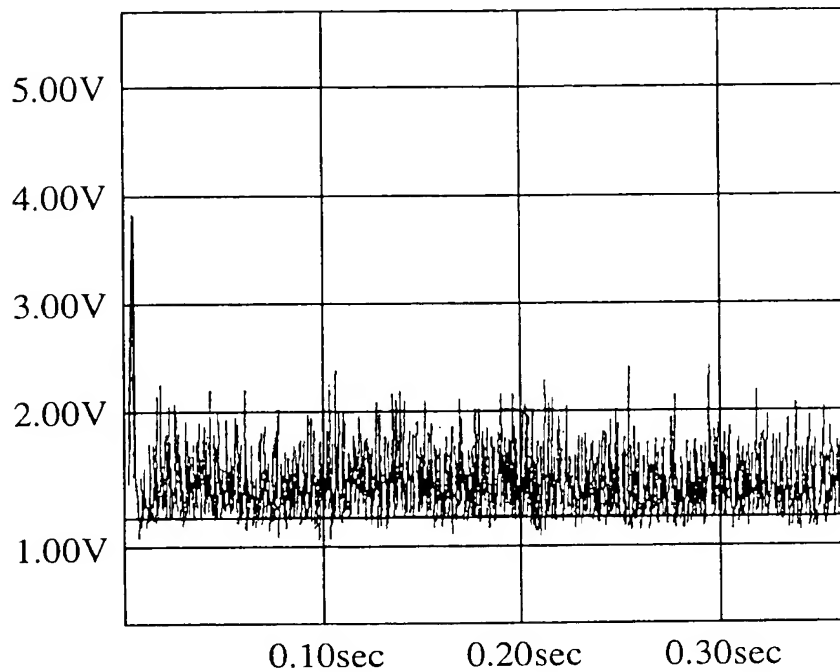
DECISION FOR UNDER-FILLED
POROUS OR NON-WELDED TO BE
PROBLEMATIC IN QUALITY

DECISION ON SUB-SECTION OF BEAD

END

FIG.19

CONFORMING



NON-WELDED

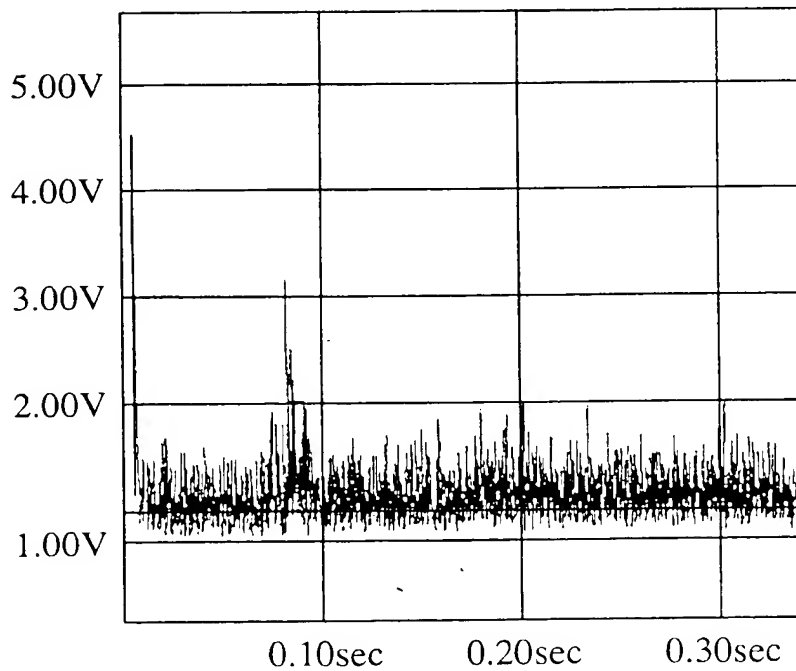


FIG.20

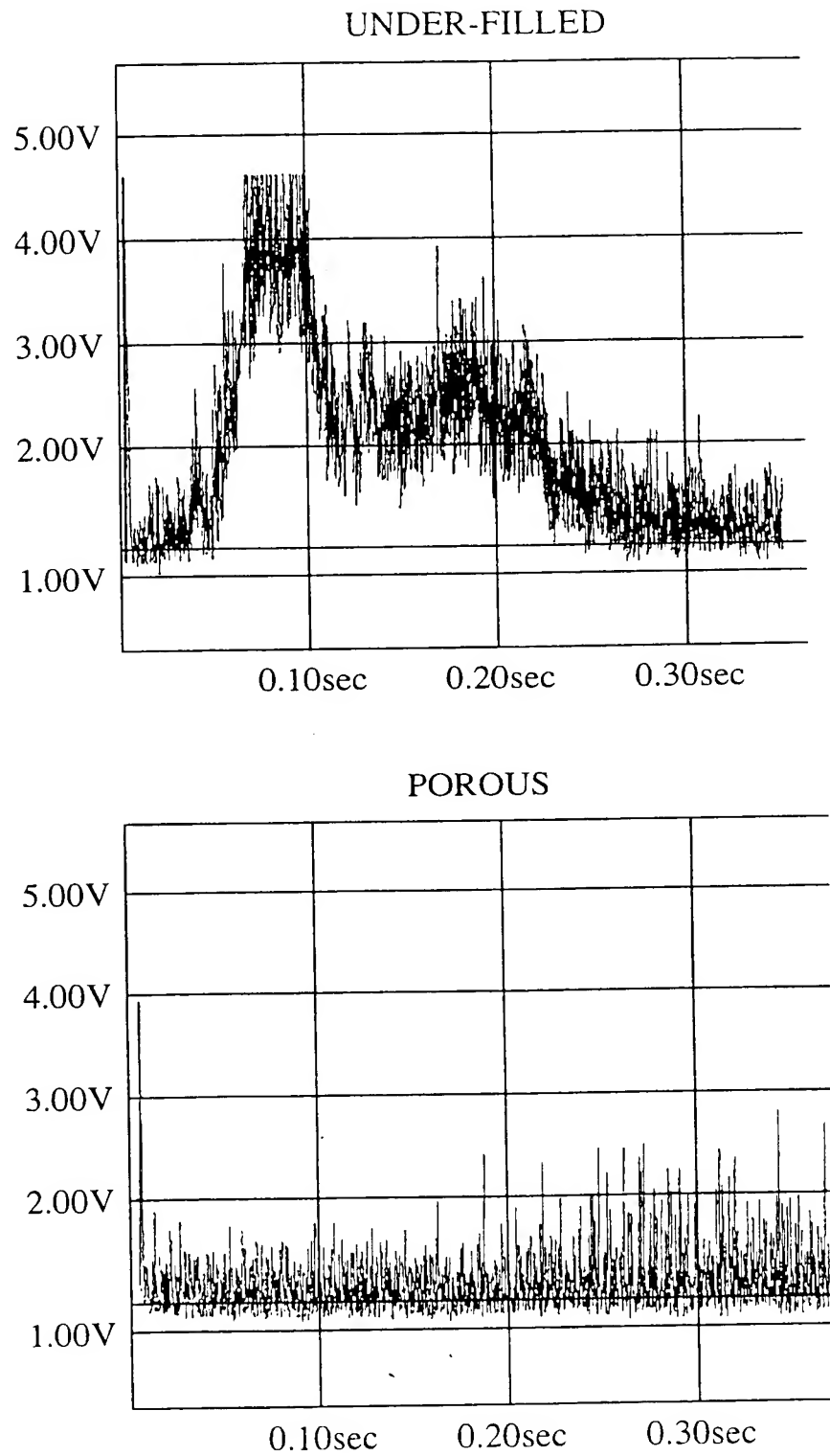


FIG. 21

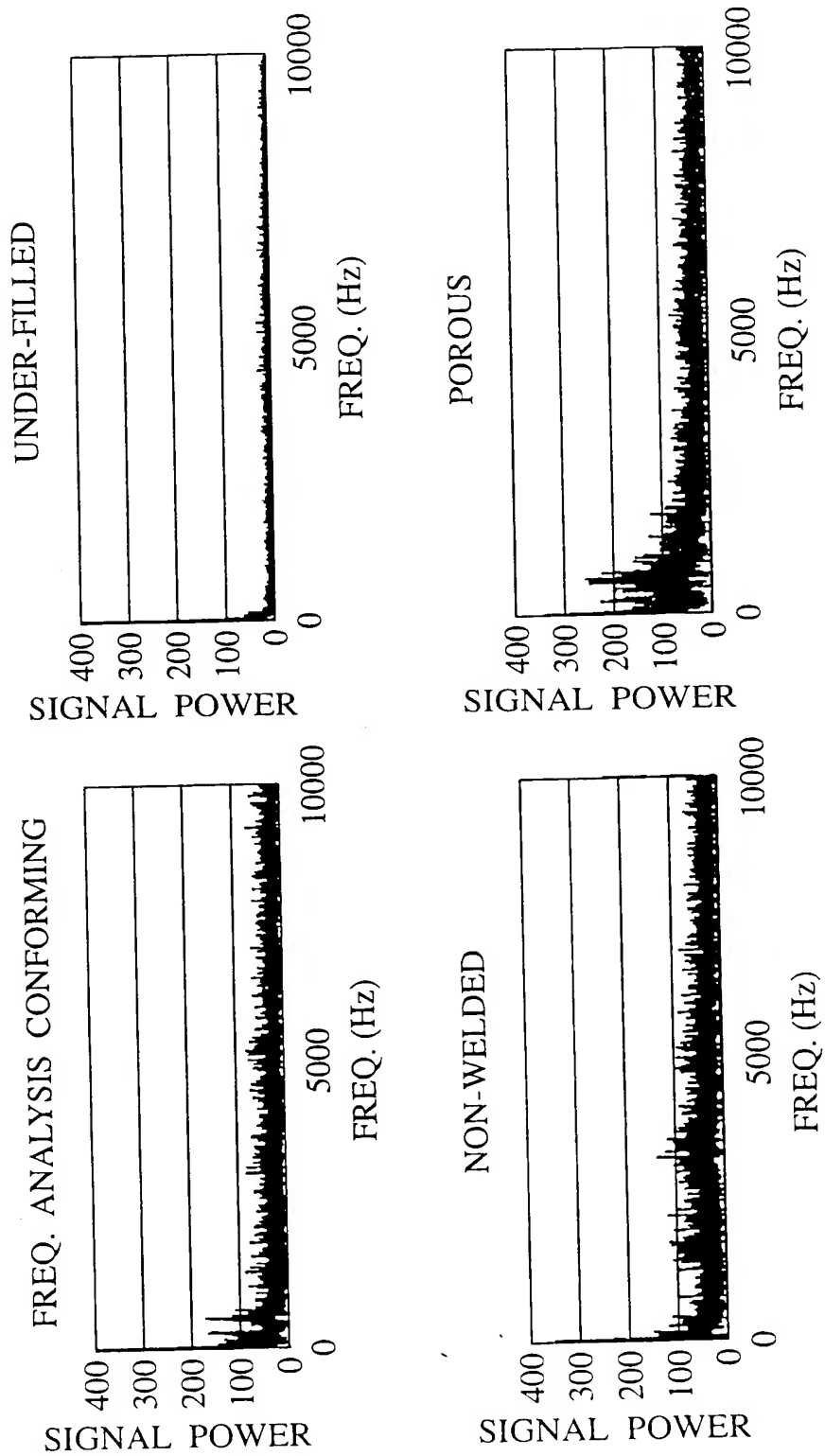


FIG.22

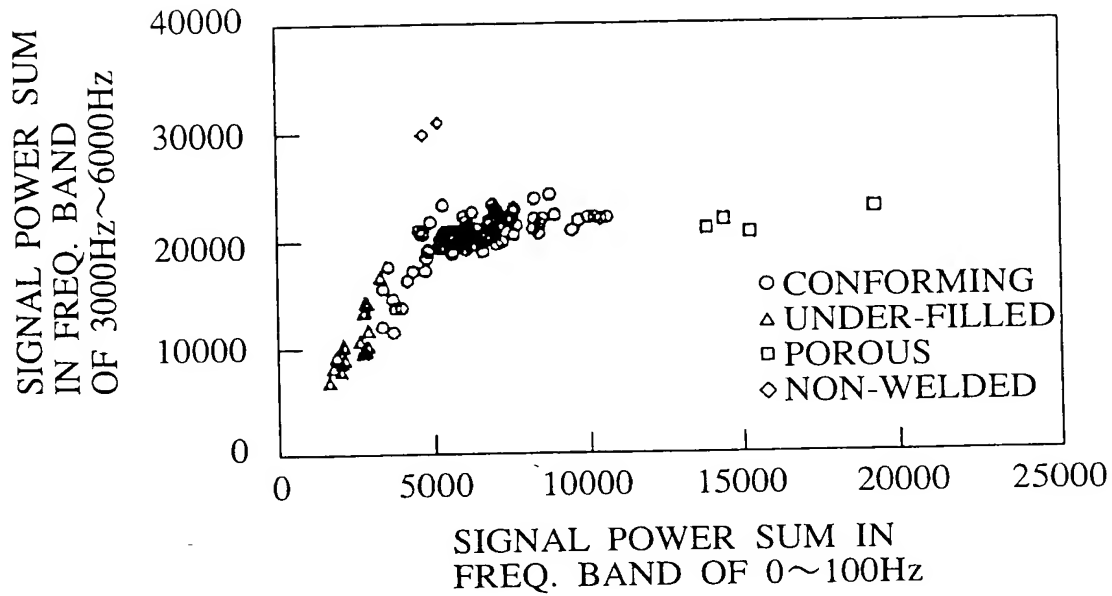


FIG.23

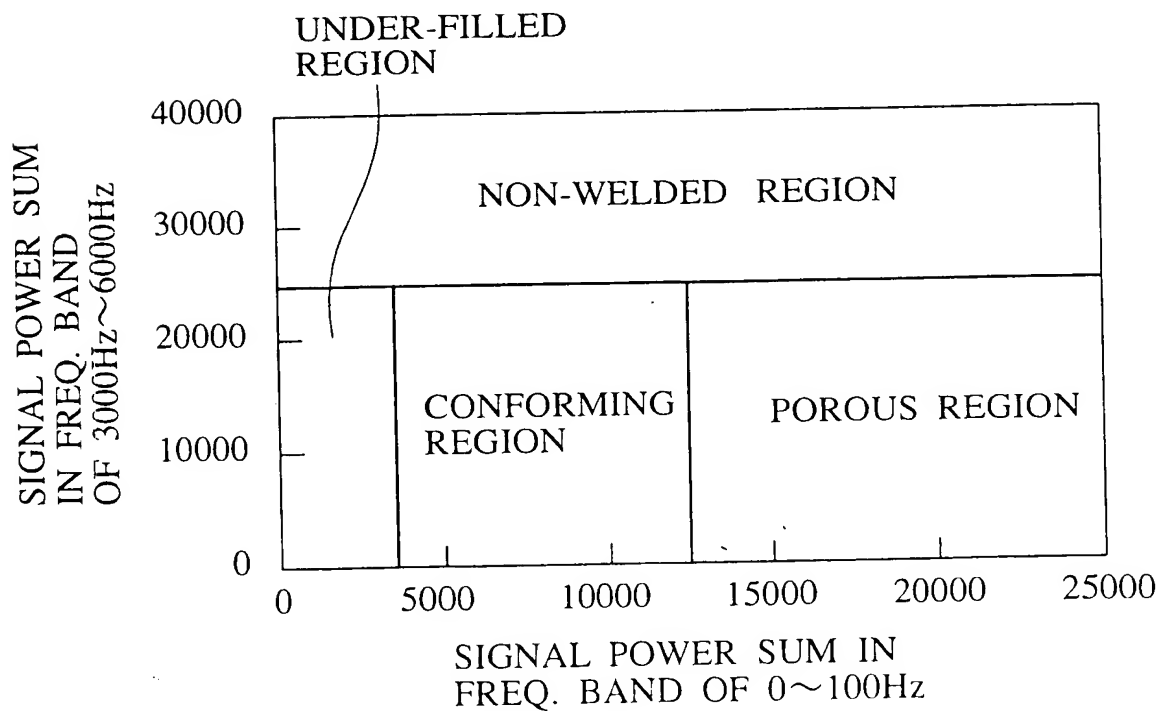


FIG.24

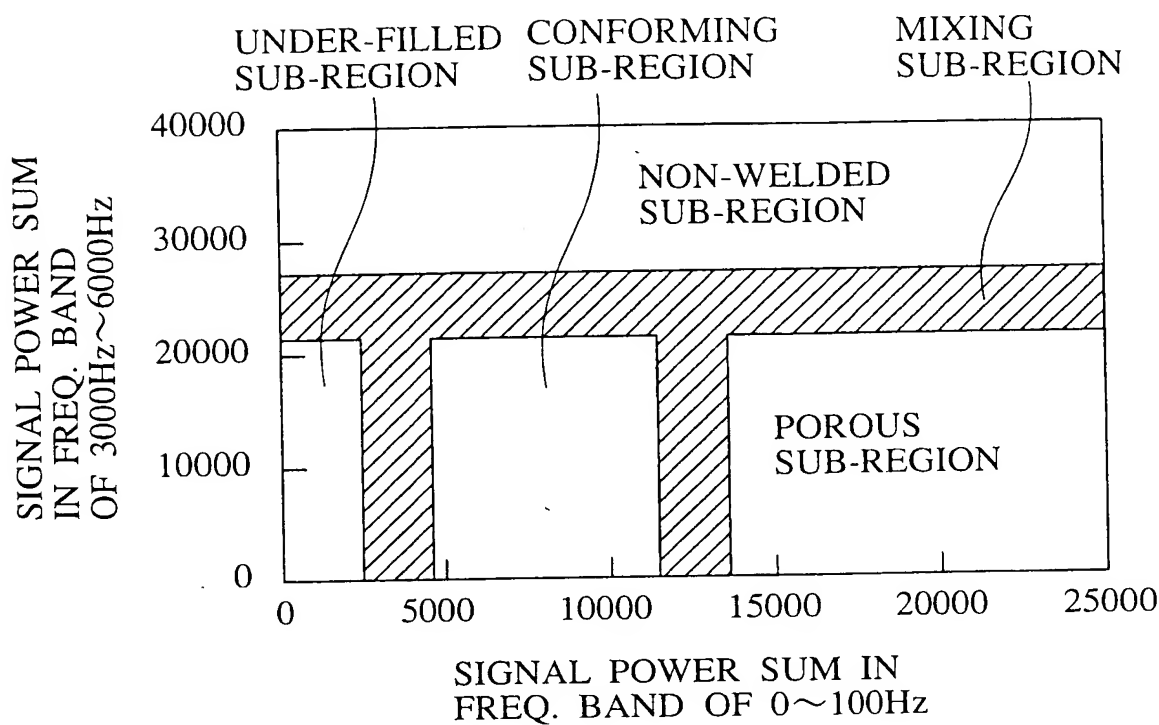
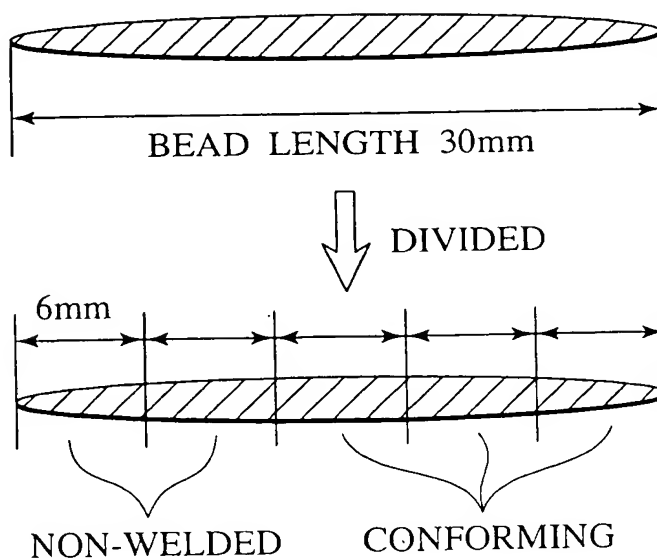


FIG.25



$$\text{CONFORMING PROPORTION} = \frac{\text{CONFORMING LENGTH 6mm} \times 3 \text{ SUB-SECTIONS}}{\text{TOTAL WELD LENGTH 30mm}} = 0.6$$

FIG.26

